

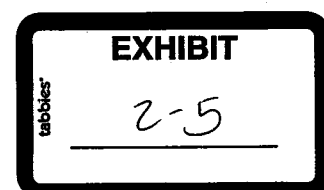
UFC 4-860-01FA
16 January 2004

UNIFIED FACILITIES CRITERIA (UFC)

RAILROAD DESIGN AND REHABILITATION



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U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

Record of Changes (changes are indicated by \1\ ... /1/)

Change No.	Date	Location

This UFC supersedes TI 850-02, dated 1 March 2000. The format of this UFC does not conform to UFC 1-300-01; however, the format will be adjusted to conform at the next revision. The body of this UFC is a document of a different number.

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FOREWORD

\1\

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.


UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Support Agency (AFCESA) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request (CCR). The form is also accessible from the Internet sites listed below.


UFC are effective upon issuance and are distributed only in electronic media from the following source:


- Whole Building Design Guide web site <http://dod.wbdg.org/>.

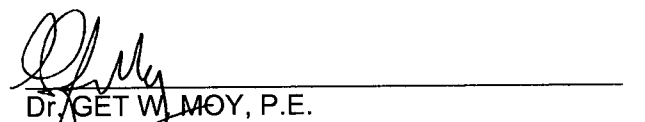
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CEMP-E

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1 MARCH 2000

(2) Common rock materials suitable for ballast are granites, traprocks, quartzites, dolomites, and hard limestones. As limestones degrade, they tend to produce fine particles that cement together, and are thus not the best ballast choice if other hard rock material is economically available. Crushed slag can also vary greatly in quality and suitability for good ballast.

c. Gradation.

(1) Table 6-8 gives recommended AREMA ballast gradations. For main running tracks, sizes 4A and 4 will be used. For loading tracks in terminal areas, size 5 may be used to facilitate easier walking along the cars during loading and unloading operations, but a larger size is preferred for long-term track maintenance. AREMA ballast gradation 4 is identical to ASTM C33 gradation 4. ASTM C33 gradation 56 is close to AREMA no. 5.

Table 6-8. Recommended Ballast Gradations

Size No.	Nominal Size Square Opening (in.)	Amounts Finer Than Each Sieve (Square Opening)							
		Percent by Weight							
		2-1/2 in.	2 in.	1-1/2 in.	1 in.	3/4 in.	1/2 in.	3/8 in.	No. 4
4A	2 to 3/4	100	90-100	60-90	10-35	0-10		0-3	
4	1-1/2 to 3/4		100	90-100	20-55	0-15		0-5	
5	1 to 3/8			100	90-100	40-75	15-35	0-15	0-5

(2) For smaller projects, where less than 200 tons of ballast is needed, and where the nearest suppliers do not stock AREMA gradations, the following AASHTO (highway) gradations may be substituted: CA5 for AREMA 4 or 4A, and CA7 for AREMA 5.

d. Depth.

(1) Appropriate ballast depth will be determined by structural analysis using the computer program specified in paragraph 6. The manual method described in paragraph 7 may also be used, but is not preferred.

(2) In all cases, the minimum depth of ballast from the bottom of the tie to the subgrade will be 8 in. In most cases, however, main running tracks will require more.

e. Cross-Section. Figures 6-1 through 6-7 show standard ballast shoulder widths and side slopes. In finished or resurfaced track, the top of ballast may be up to 1 in. below the top of the tie, but never above the top.

13. SUB-BALLAST.

a. Purpose. Sub-ballast is a layer of material between the top ballast and subgrade with a gradation finer than the top ballast and coarser than the subgrade. Sub-ballast is often cheaper than top ballast, so it can be used to reduce total ballast cost or to provide a filter layer between the top ballast and a fine-grained subgrade. Figures 6-2, 6-4, 6-5, and 6-7 show sub-ballast layer.

b. Application. A sub-ballast layer is recommended for most new construction. In addition to providing a filter to keep subgrade particles from working up into and fouling the ballast, it provides a good mat to